29 June 1995

The Honourable Lloyd Axworthy, P.C., M.P.
Minister of Human Resources Development
House of Commons
Ottawa, Ontario
K1A 0G5

Dear Minister:

Pursuant to section 6 of the *Public Pensions Reporting Act*, I am pleased to submit my report on the actuarial review, as at 31 December 1993, of the pension plan established under the *Old Age Security Act*.

Yours sincerely,

Bernard Dussault
Chief Actuary

OLD AGE SECURITY PROGRAM

THIRD STATUTORY ACTUARIAL REPORT AS AT 31 DECEMBER 1993

TABLE OF CONTENTS

MAIN BODY OF THE REPORT

APPENDICES

OLD AGE SECURITY PROGRAM

THIRD STATUTORY ACTUARIAL REPORT

AS AT 31 DECEMBER 1993

I- Introduction

This is the Third Statutory Actuarial Report since the inception of the Old Age Security (OAS) program in 1952. It has been prepared in compliance with the *Public Pensions Reporting Act* which requires the Chief Actuary in the Office of the Superintendent of Financial Institutions to conduct actuarial reviews in respect of the pension plan established under Part I of the *Old Age Security Act* not later than as at 31 December 1988 and, thereafter, at least every three years. The previous triennial report is the Second Actuarial Report, as at 31 December 1991, which was tabled in the House of Commons on 7 February 1994.

For Parts II (the Guaranteed Income Supplement) and II.1 (the Spouse's Allowance) of the *Old Age Security Act*, the date of the first report is to be fixed by the Governor in Council.

No amendment having a material effect on OAS financial projections has been made since the preparation of the previous report.

II- Key Ultimate Demographic and Economic Assumptions

The full set of assumptions (demographic and economic, short-term and ultimate, key and secondary) underlying the main financial projections of this report is described in Appendix B.

The subset of main key ultimate assumptions is briefly described below. The year indicated in brackets corresponds to the ultimate year, i.e., the first year within the projection period (1994 to 2100) for which the values specified by the assumptions become constant.

Rate of increase in earnings:	4.5% (2000)
Rate of increase in prices:	3.5% (2000)
Mortality:	1985-87 Canada Life Tables adjusted for future improvements in life expectancy (2100)
Net annual immigration to Canada (percentage of population):	0.4% (1991)
Total fertility rate:	1.85 (2000)

III- Results of the Actuarial Examination

1. Main Findings

The OAS costs, expressed in dollar amounts or as a percentage of total employment earnings, are affected by the key economic and demographic assumptions used in the estimates. However, the dollar amount of benefits are not affected by the assumed annual rate of increase in average earnings. Although it is useful to express the total cost as a percentage of total employment earnings in Canada, it should be noted that the OAS program is financed from general federal tax revenues. For this reason, the OAS costs are also shown as a percentage of the Gross Domestic Product (GDP) in this report. Moreover, to facilitate comparisons of the OAS with the Canada Pension Plan (CPP) and the Québec Pension Plan (QPP), OAS costs are also shown as a percentage of CPP/QPP contributory earnings.

(a) Economic

Being of a flat-rate nature, OAS benefits are not related to earnings. They vary in accordance with the rate of inflation. Consequently, the costs, expressed as a percentage of total employment earnings, are affected by the differential between the assumed rates of increase in earnings and prices. The Main Table assumes a differential of 1.0% during the ultimate period, i.e., 4.5% for earnings increases and 3.5% for prices increases. A decrease in the differential between the assumed rates of increase in earnings and prices produces an increase in costs expressed as a percentage of total employment earnings. Conversely, an increase in the differential produces a decrease in costs.

(b) Demographic

The demographic assumptions with respect to future longevity improvements and the ultimate level of fertility lower than the one that has prevailed, on average, for the current population, contribute to a population-aging process that causes cost increases as long as the process continues. However, the assumed ultimate level of net immigration reduces somewhat the effect of aging.

If it were only for the economic factor described in paragraph (a) above, the projected OAS cost would normally decrease gradually and for ever over the years. However, the pattern of OAS projected future costs is affected as follows by the temporary and permanent demographic factors described in (b) above:

- **1995-2005 decrease: early century baby busters**
  Due mainly to the important drop in fertility rates from 1910 to 1940, which compounds with the economic factor, the OAS projected cost decreases from 4.08% of employment earnings in 1994 3.58% in 2005.

- **2010-2035 increase: baby boomers, baby busters & longevity**
  The expected decrease in OAS costs due to the economic factor is temporarily more than offset from 2010 to 2035 by the effect of the 1945-1965 baby boomers (higher benefits when they start reaching their retirement age), this effect being compounded with that of the baby-busters (lower earnings resulting from the drop in fertility since 1970) and the longevity

improvements. During the 25-year period from 2010 to 2035, the OAS cost is accordingly projected to increase from 3.65% to 4.99% of employment earnings.

- **2040-2065 decrease: baby busters and longevity**
  From 2040, at which time the youngest baby boomers are already 75 years old, to 2065, at which time the drop in fertility-related first part of the population aging process is practically matured as people born in 1970 would then be 95 years old, the expected OAS cost decrease due the economic factor is larger than the temporary cost increase resulting from that part of the limited population aging process caused by the decrease in fertility from an average level of about 3.0 for 1900 to 1965 to a somewhat constant level of about 1.85 after 1970. The projected OAS cost is accordingly decreasing from 4.73% in 2040 to 3.67% in 2065.

- **2070-2100 decrease: longevity**
  The secondary part of the population aging process caused by sustained improvements in longevity continues to affect permanently the OAS cost after 2065 but this is largely offset by the effect of the above mentioned economic factor. The OAS cost is accordingly projected to decrease indefinitely after 2065, i.e., from 3.51% in 2070 to 2.75% in 2100.

2. Main Table of Financial Projections

YEAR	POPULATION AGED 65 & OVER	ELIGIBILITY RATE	NUMBER OF BENEFICIARIES	AVERAGE BENEFIT	TOTAL BENEFITS	ADMINISTRATIVE EXPENSES	TOTAL EXPENDITURES	EARNINGS BASIS			TOTAL COST AS PERCENTAGE OF		
								EMPLOYMENT	CPP/QPP CONTRIBUTORY	GDP	EMPLOYMENT EARNINGS	CPP/QPP CONTRIB. EARNINGS	GROSS DOMESTIC PRODUCT
	#		#	$	$ million	$ million	$ million	$ million	$ million	$ million	%	%	%
1994	3457549	0.9754	3372492	4575	15428	54	15482	379144	256542	758288	4.08	6.03	2.04
1995	3538224	0.9754	3451182	4605	15893	56	15949	402301	270259	804602	3.96	5.90	1.98
1996	3618380	0.9754	3529366	4667	16470	58	16528	430651	285417	861301	3.84	5.79	1.92
1997	3694445	0.9754	3603560	4752	17125	60	17185	451589	298303	903178	3.81	5.76	1.90
1998	3764236	0.9754	3671635	4863	17856	62	17918	475752	313410	951505	3.77	5.72	1.88
1999	3823068	0.9754	3729020	5001	18649	65	18714	503575	330969	1007151	3.72	5.65	1.86
2000	3882516	0.9754	3787004	5168	19570	68	19639	535442	350266	1070884	3.67	5.61	1.83
2005	4182897	0.9754	4079996	6138	25042	88	25129	701705	458734	1403410	3.58	5.48	1.79
2010	4648131	0.9754	4533785	7290	33050	116	33165	909506	592008	1819011	3.65	5.60	1.82
2015	5432367	0.9754	5298729	8658	45876	161	46036	1161501	756239	2323002	3.96	6.09	1.98
2020	6317332	0.9754	6161925	10283	63362	222	63584	1467461	955278	2934922	4.33	6.66	2.17
2025	7349653	0.9754	7168850	12213	87551	306	87858	1840680	1199167	3681360	4.77	7.33	2.39
2030	8272814	0.9754	8069301	14505	117044	410	117454	2314507	1511282	4629014	5.07	7.77	2.54
2035	8698040	0.9754	8484067	17227	146157	512	146669	2938252	1920187	5876505	4.99	7.64	2.50
2040	8861481	0.9754	8643488	20461	176851	619	177470	3748868	2451023	7497736	4.73	7.24	2.37
2045	8910395	0.9754	8691198	24301	211203	739	211942	4778431	3126705	9556862	4.44	6.78	2.22
2050	8976060	0.9754	8755248	28862	252691	884	253576	6067162	3971091	12134323	4.18	6.39	2.09
2055	9085147	0.9754	8861651	34279	303765	1063	304829	7680675	5030136	15361350	3.97	6.06	1.98
2060	9311343	0.9754	9082283	40712	369760	1294	371055	9718757	6366292	19437514	3.82	5.83	1.91
2065	9534752	0.9754	9300196	48353	449696	1574	451270	12310031	8066772	24620062	3.67	5.59	1.83
2070	9749762	0.9754	9509916	57429	546142	1911	548053	15614040	10234646	31228080	3.51	5.35	1.76
2075	9961188	0.9754	9716142	68207	662711	2319	665031	19798016	12980214	39596032	3.36	5.12	1.68
2080	10197187	0.9754	9946335	81009	805741	2820	808561	25070034	16441501	50140068	3.23	4.92	1.61
2085	10459418	0.9754	10202115	96213	981577	3436	985013	31722552	20809864	63445104	3.11	4.73	1.55
2090	10727849	0.9754	10463943	114271	1195725	4185	1199910	40154024	26346024	80308048	2.99	4.55	1.49
2095	10986678	0.9754	10716404	135718	1454410	5090	1459500	50867576	33378516	101735152	2.87	4.37	1.43

2100	**11237233**	**0.9754**	**10960796**	**161190**	**1766776**	**6184**	**1772960**	**64468336**	**42309872**	**128936672**	**2.75**	**4.19**	**1.38**

3. Comparison with the Previous Report

One way of analysing the various factors that affected the projections of this report in comparison to those of the previous report's, some positively, some negatively, is by looking at the step-by-step evolution of the total annual dollar amount of expenditures and of its value relative to earnings (i.e., the ratio of the year's expenditure to the year's total employment earnings) from the previous report to this report.

The two charts below presents a concise application of this approach.

The first chart on expenditures expressed as a percentage of employment earnings indicates that the projected costs of this report are lower than those of the previous report by about 8% mainly because of methodology refinements in respect of the computation and projection of employment earnings. The refined methodology is described in Appendix B.

The second chart on expenditures expressed in absolute current dollars indicates that the projected costs of this report are lower than those of the previous report by about 2% mainly because of the lower actual and assumed prices increases in the short term (1994 to 1999).

RECONCILIATION OF COSTS RELATIVE TO EARNINGS

	1994 %	1995 %	2000 %	2025 %	2050 %	2100 %
Second Report rates:	4.27	4.19	3.99	5.23	4.58	3.13
I- **Data**						
A- Demographic	-0.02	-0.03	-0.05	0.04	0.07	0.00
B- Economic (1)	0.00	-0.04	-0.09	-0.13	-0.11	-0.08
C- Benefits in pay	0.01	0.02	0.01	0.02	0.02	0.01
Sub-Total I	-0.01	-0.05	-0.13	-0.07	-0.02	-0.07
II- **Assumptions**						
A- Demographic	-0.03	-0.03	-0.01	-0.02	0.01	0.01
B- Economic	0.00	0.01	-0.01	-0.01	-0.01	-0.01
Sub-Total II	-0.03	-0.02	-0.02	-0.03	0.00	0.00
III- **Methodology** (2)	-0.15	-0.16	-0.17	-0.36	-0.38	-0.31
Total I + II + III	-0.19	-0.23	-0.32	-0.46	-0.40	-0.38
Third Report rates:	4.08	3.96	3.67	4.77	4.18	2.75

(1) Most of the effect shown is due to the nil price increase in 1994.
(2) All of the effect shown is due to refinements in the computation of employment earnings.

RECONCILIATION OF ANNUAL EXPENDITURES
(MILLIONS OF DOLLARS)

	1994 $	1995 $	2000 $	2025 $	2050 $	2100 $
Second Report expenditures:	15,655	16,342	20,165	88,839	254,042	1,804,110
I- **Data**						
A- Demographic (1)	144	146	205	2,097	6,965	23,662
B- Economic (2)	(280)	(404)	(501)	(2,232)	(6,376)	(44,270)
C- Benefits in pay	59	62	75	336	967	6,764
Sub-Total I	(77)	(196)	(221)	201	1,556	(13,844)
II- **Assumptions**						
A- Demographic	(96)	(91)	(70)	(137)	973	3,635
B- Economic (3)	---	(106)	(235)	(1,045)	(2,995)	(20,941)
Sub-Total II	(96)	(197)	(305)	(1,182)	(2,022)	(17,306)
III- **Methodology**	---	---	---	---	---	(1)
Total I + II + III	(173)	(393)	(526)	(981)	(466)	(31,151)
Third Report expenditures:	15,482	15,949	19,639	87,858	253,576	1,772,959

(1) Most of the effect shown is due to the change in the definition of permanent residents.
(2) Most of the effect shown is due to the nil price increase in 1994.
(3) Most of the effect shown is due to the revised (lower) assumed prices increases for 1995 to 2000.

4. Sensitivity of Results to Assumptions

The projections in the five auxiliary tables below have been prepared to provide an indication of the degree to which the results of this report depend on each of its key assumptions. The differences between the results shown in the main table and in those of the auxiliary tables can also serve as the basis for deriving a reasonable approximation of the projected effect of larger or smaller changes in the value specified by one or more of the key assumptions. However, any such calculation does not take into account either the extent to which the effect of changing a given assumption may not be strictly linear, or the interaction effect that may come into play when more than one assumption is changed.

Each of the five auxiliary tables is based on a set of assumptions that differs in the following respects from the set underlying the main table:

Auxiliary table 1: 0.1 arithmetic increase in the total ultimate **fertility** rate, i.e., 1.95 instead of 1.85.

Auxiliary table 2: 10% geometric increase in the **net immigration** to Canada (for 1991, 124,300 or 0.44% of the Canada population, instead of 113,000 or 0.4% of the Canada population).

Auxiliary table 3: **improvements in life expectancy:** 10% geometric decrease in each of the annual mortality reduction factors assumed for 1987 and later years
(i.e., a reduction factor of 0.8 would be decreased to 0.72).

Auxiliary table 4: 0.25% arithmetic increase in the ultimate annual rate of increase in **earnings**
(i.e., 4.75% instead of 4.5%).

Auxiliary table 5: 0.25% arithmetic decrease in the ultimate annual rate of increase in **prices**
(i.e., 3.25% instead of 3.5%).

The following table shows sample costs, expressed as percentages of total employment earnings, as taken from the main table and each of the five auxiliary tables.

	Main	AUXILIARY TABLES				
YEAR	Table	Table 1	Table 2	Table 3	Table 4	Table 5
	%	%	%	%	%	%
1994	4.08	4.08	4.08	4.08	4.08	4.08
1995	3.96	3.96	3.96	3.96	3.96	3.96
1996	3.84	3.84	3.83	3.83	3.84	3.84
1997	3.81	3.81	3.80	3.80	3.81	3.81
1998	3.77	3.77	3.76	3.76	3.77	3.77
1999	3.72	3.72	3.70	3.71	3.72	3.72
2000	3.67	3.67	3.65	3.66	3.66	3.66
2025	4.77	4.71	4.70	4.73	4.49	4.49
2050	4.18	3.99	4.11	4.11	3.70	3.70
2100	2.75	2.60	2.70	2.68	2.16	2.16

AUXILIARY TABLE 1 (fertility rate: +0.1)

YEAR	POPULATION 65 AND OVER	ELIGIBILITY RATE	NUMBER OF BENE-FICIARIES	AVERAGE BENEFIT	TOTAL BENEFITS	ADMIN. EXPENSES	TOTAL EXPEN-DITURES	EARNINGS BASIS			TOTAL COST AS PERCENTAGE OF		
								EMPLOYMENT	CPP/QPP CONTRIBUTORY	GDP	EMPLOYMENT EARNINGS	CPP/QPP CONTRIB. EARNINGS	GROSS DOMESTIC PRODUCT
	#		#	$	$ million	$ million	$ million	$ million	$ million	$ million	%	%	%
1994	3457549	0.9754	3372492	4575	15428	54	15482	379144	256542	758288	4.08	6.03	2.04
1995	3538224	0.9754	3451182	4605	15893	56	15949	402302	270260	804603	3.96	5.90	1.98
1996	3618380	0.9754	3529366	4667	16470	58	16528	430652	285419	861305	3.84	5.79	1.92
1997	3694446	0.9754	3603561	4752	17125	60	17185	451592	298306	903185	3.81	5.76	1.90
1998	3764238	0.9754	3671637	4863	17856	62	17918	475759	313414	951519	3.77	5.72	1.88
1999	3823072	0.9754	3729024	5001	18649	65	18714	503587	330977	1007175	3.72	5.65	1.86
2000	3882526	0.9754	3787014	5168	19570	68	19639	535461	350278	1070922	3.67	5.61	1.83
2005	4182963	0.9754	4080060	6138	25042	88	25130	701805	458799	1403610	3.58	5.48	1.79
2010	4648355	0.9754	4534004	7290	33051	116	33167	909802	592203	1819604	3.65	5.60	1.82
2015	5432899	0.9754	5299248	8658	45880	161	46041	1164078	757481	2328157	3.96	6.08	1.98
2020	6318360	0.9754	6162927	10283	63372	222	63594	1477967	960722	2955934	4.30	6.62	2.15
2025	7351417	0.9754	7170571	12213	87572	307	87879	1864298	1212835	3728595	4.71	7.25	2.36
2030	8275689	0.9754	8072106	14505	117085	410	117495	2357538	1537686	4715076	4.98	7.64	2.49
2035	8702612	0.9754	8488527	17227	146234	512	146746	3010797	1965878	6021594	4.87	7.46	2.44
2040	8868572	0.9754	8650404	20461	176992	619	177612	3866822	2526098	7733644	4.59	7.03	2.30
2045	8921041	0.9754	8701582	24301	211455	740	212195	4966308	3246723	9932615	4.27	6.54	2.14
2050	8991434	0.9754	8770243	28862	253124	886	254010	6359778	4158644	12719555	3.99	6.11	2.00
2055	9106565	0.9754	8882543	34279	304482	1066	305547	8123026	5314928	16246052	3.76	5.75	1.88
2060	9351518	0.9754	9121469	40712	371356	1300	372655	10362376	6781677	20724752	3.60	5.50	1.80
2065	9648535	0.9754	9411180	48353	455063	1593	456655	13219264	8654559	26438528	3.45	5.28	1.73
2070	9959970	0.9754	9714954	57429	557917	1953	559870	16886970	11058902	33773940	3.32	5.06	1.66
2075	10260686	0.9754	10008272	68207	682637	2389	685026	21577640	14133857	43155280	3.17	4.85	1.59
2080	10580902	0.9754	10320611	81009	836061	2926	838987	27547072	18049016	55094144	3.05	4.65	1.52
2085	10928402	0.9754	10659562	96213	1025589	3590	1029179	35142256	23031556	70284512	2.93	4.47	1.46
2090	11292034	0.9754	11014248	114271	1258609	4405	1263014	44832232	29387892	89664464	2.82	4.30	1.41
2095	11658964	0.9754	11372152	135718	1543407	5402	1548808	57224284	37514372	114448568	2.71	4.13	1.35
2100	12023738	0.9754	11727953	161190	1890434	6617	1897051	73075064	47913568	146150128	2.60	3.96	1.30

AUXILIARY TABLE 2 (net immigration: +10%)

YEAR	POPULATION 65 AND OVER	ELIGIBILITY RATE	NUMBER OF BENE-FICIARIES	AVERAGE BENEFIT	TOTAL BENEFITS	ADMIN. EXPENSES	TOTAL EXPEN-DITURES	EARNINGS BASIS: EMPLOYMENT	EARNINGS BASIS: CPP/QPP CONTRIBUTORY	EARNINGS BASIS: GDP	TOTAL COST AS PERCENTAGE OF: EMPLOYMENT EARNINGS	TOTAL COST AS PERCENTAGE OF: CPP/QPP CONTRIB. EARNINGS	TOTAL COST AS PERCENTAGE OF: GROSS DOMESTIC PRODUCT
	#		#	$	$ million	$ million	$ million	$ million	$ million	$ million	%	%	%
1994	3457714	0.9754	3372653	4575	15428	54	15482	379553	256820	759107	4.08	6.03	2.04
1995	3538560	0.9754	3451510	4605	15895	56	15950	402954	270700	805907	3.96	5.89	1.98
1996	3618950	0.9754	3529922	4667	16473	58	16530	431583	286039	863167	3.83	5.78	1.92
1997	3695306	0.9754	3604400	4752	17129	60	17189	452814	299117	905628	3.80	5.75	1.90
1998	3765450	0.9754	3672818	4863	17861	63	17924	477304	314438	954607	3.76	5.70	1.88
1999	3824690	0.9754	3730602	5001	18657	65	18722	505494	332239	1010988	3.70	5.64	1.85
2000	3884605	0.9754	3789042	5168	19581	69	19649	537777	351805	1075554	3.65	5.59	1.83
2005	4188138	0.9754	4085108	6138	25073	88	25161	706631	461987	1413262	3.56	5.45	1.78
2010	4657845	0.9754	4543260	7290	33119	116	33235	918425	597894	1836850	3.62	5.56	1.81
2015	5448169	0.9754	5314143	8658	46009	161	46170	1176498	766110	2352995	3.92	6.03	1.96
2020	6342004	0.9754	6185989	10283	63609	223	63832	1491408	970995	2982817	4.28	6.57	2.14
2025	7387530	0.9754	7205795	12213	88002	308	88310	1877365	1223220	3754729	4.70	7.22	2.35
2030	8329806	0.9754	8124892	14505	117851	412	118263	2368810	1546921	4737620	4.99	7.65	2.50
2035	8779943	0.9754	8563955	17227	147534	516	148050	3016788	1971751	6033576	4.91	7.51	2.45
2040	8971638	0.9754	8750934	20461	179049	627	179676	3860736	2524483	7721471	4.65	7.12	2.33
2045	9050186	0.9754	8827550	24301	214516	751	215267	4936031	3230233	9872062	4.36	6.66	2.18
2050	9146442	0.9754	8921438	28862	257488	901	258389	6287189	4115600	12574378	4.11	6.28	2.05
2055	9286883	0.9754	9058425	34279	310511	1087	311597	7985288	5230244	15970576	3.90	5.96	1.95
2060	9545650	0.9754	9310826	40712	379065	1327	380392	10136937	6641000	20273874	3.75	5.73	1.88
2065	9804434	0.9754	9563243	48353	462415	1618	464034	12879730	8441104	25759460	3.60	5.50	1.80
2070	10056955	0.9754	9809552	57429	563350	1972	565321	16386274	10742128	32772548	3.45	5.26	1.72
2075	10307364	0.9754	10053801	68207	685742	2400	688142	20840846	13665582	41681692	3.30	5.04	1.65
2080	10583667	0.9754	10323307	81009	836279	2927	839206	26473592	17364060	52947184	3.17	4.83	1.58
2085	10887736	0.9754	10619897	96213	1021773	3576	1025349	33605520	22047676	67211040	3.05	4.65	1.53
2090	11199994	0.9754	10924472	114271	1248350	4369	1252719	42672100	28001498	85344200	2.94	4.47	1.47
2095	11504874	0.9754	11221852	135718	1523008	5331	1528339	54225516	35586188	108451032	2.82	4.29	1.41
2100	11803680	0.9754	11513308	161190	1855836	6495	1862331	68935672	45247152	137871344	2.70	4.12	1.35

AUXILIARY TABLE 3 (improvement in life expectancy: -10%)

YEAR	POPULATION 65 AND OVER	ELIGIBILITY RATE	NUMBER OF BENE-FICIARIES	AVERAGE BENEFIT	TOTAL BENEFITS	ADMIN. EXPENSES	TOTAL EXPEN-DITURES	EARNINGS BASIS			TOTAL COST AS PERCENTAGE OF		
								EMPLOYMENT	CPP/QPP CONTRIBUTORY	GDP	EMPLOYMENT EARNINGS	CPP/QPP CONTRIB. EARNINGS	GROSS DOMESTIC PRODUCT
	#		#	$	$ million	$ million	$ million	$ million	$ million	$ million	%	%	%
1994	3453764	0.9754	3368800	4575	15411	54	15465	379117	256523	758233	4.08	6.03	2.04
1995	3532926	0.9754	3446015	4605	15869	56	15925	402256	270229	804512	3.96	5.89	1.98
1996	3611445	0.9754	3522602	4667	16439	58	16496	430585	285374	861170	3.83	5.78	1.92
1997	3685772	0.9754	3595101	4752	17085	60	17144	451501	298245	903001	3.80	5.75	1.90
1998	3753722	0.9754	3661379	4863	17806	62	17868	475638	313334	951276	3.76	5.70	1.88
1999	3810632	0.9754	3716890	5001	18588	65	18653	503432	330875	1006863	3.71	5.64	1.85
2000	3868080	0.9754	3772924	5168	19498	68	19566	535264	350149	1070528	3.66	5.59	1.83
2005	4157579	0.9754	4055302	6138	24890	87	24977	701315	458478	1402631	3.56	5.45	1.78
2010	4610799	0.9754	4497372	7290	32784	115	32899	908794	591545	1817588	3.62	5.56	1.81
2015	5381581	0.9754	5249194	8658	45447	159	45606	1160332	755483	2320664	3.93	6.04	1.97
2020	6251680	0.9754	6097887	10283	62703	219	62923	1465673	954124	2931346	4.29	6.59	2.15
2025	7266503	0.9754	7087745	12213	86561	303	86864	1838078	1197486	3676157	4.73	7.25	2.36
2030	8169583	0.9754	7968609	14505	115584	405	115988	2310803	1508876	4621606	5.02	7.69	2.51
2035	8574220	0.9754	8363293	17227	144077	504	144581	2932942	1916726	5865885	4.93	7.54	2.46
2040	8717384	0.9754	8502936	20461	173975	609	174584	3741217	2446027	7482434	4.67	7.14	2.33
2045	8748033	0.9754	8532831	24301	207354	726	208080	4767434	3119520	9534869	4.36	6.67	2.18
2050	8798468	0.9754	8582025	28862	247692	867	248559	6051530	3960880	12103061	4.11	6.28	2.05
2055	8895601	0.9754	8676768	34279	297428	1041	298469	7658764	5015814	15317529	3.90	5.95	1.95
2060	9110846	0.9754	8886718	40712	361798	1266	363065	9688391	6346439	19376782	3.75	5.72	1.87
2065	9322918	0.9754	9093573	48353	439705	1539	441244	12268198	8039401	24536396	3.60	5.49	1.80
2070	9524336	0.9754	9290036	57429	533515	1867	535382	15556591	10197036	31113182	3.44	5.25	1.72
2075	9719538	0.9754	9480437	68207	646635	2263	648898	19719352	12928702	39438704	3.29	5.02	1.65
2080	9937834	0.9754	9693362	81009	785248	2748	787996	24962850	16371300	49925700	3.16	4.81	1.58
2085	10181980	0.9754	9931502	96213	955540	3344	958885	31577230	20714652	63154460	3.04	4.63	1.52
2090	10432476	0.9754	10175836	114271	1162803	4070	1166872	39957628	26217312	79915256	2.92	4.45	1.46
2095	10673302	0.9754	10410737	135718	1412925	4945	1417870	50602680	33204880	101205360	2.80	4.27	1.40
2100	10905258	0.9754	10636986	161190	1714581	6001	1720582	64111788	42076088	128223576	2.68	4.09	1.34

AUXILIARY TABLE 4 (earnings: +0.25%)

YEAR	POPULATION 65 AND OVER #	ELIGIBILITY RATE	NUMBER OF BENE-FICIARIES #	AVERAGE BENEFIT $	TOTAL BENEFITS $ million	ADMIN. EXPENSES $ million	TOTAL EXPEN-DITURES $ million	EARNINGS BASIS: CPP/QPP EMPLOYMENT $ million	EARNINGS BASIS: CPP/QPP CONTRIBUTORY $ million	EARNINGS BASIS: GDP $ million	TOTAL COST AS PERCENTAGE OF CPP/QPP EMPLOYMENT EARNINGS %	TOTAL COST AS PERCENTAGE OF CPP/QPP CONTRIB. EARNINGS %	TOTAL COST AS PERCENTAGE OF GROSS DOMESTIC PRODUCT %
1994	3457549	0.9754	3372492	4575	15428	54	15482	379144	256542	758288	4.08	6.03	2.04
1995	3538224	0.9754	3451182	4605	15893	56	15949	402301	270259	804602	3.96	5.90	1.98
1996	3618380	0.9754	3529366	4667	16470	58	16528	430651	285417	861301	3.84	5.79	1.92
1997	3694445	0.9754	3603560	4752	17125	60	17185	451589	298303	903178	3.81	5.76	1.90
1998	3764236	0.9754	3671635	4863	17856	62	17918	475752	313410	951505	3.77	5.72	1.88
1999	3823068	0.9754	3729020	5001	18649	65	18714	503575	330969	1007151	3.72	5.65	1.86
2000	3882516	0.9754	3787004	5168	19570	68	19639	536723	350712	1073445	3.66	5.60	1.83
2005	4182897	0.9754	4079996	6138	25042	88	25129	711837	463622	1423675	3.53	5.42	1.77
2010	4648131	0.9754	4533785	7290	33050	116	33165	933727	607266	1867454	3.55	5.46	1.78
2015	5432367	0.9754	5298729	8658	45876	161	46036	1206766	783734	2413531	3.81	5.87	1.91
2020	6317332	0.9754	6161925	10283	63362	222	63584	1542974	1002047	3085948	4.12	6.35	2.06
2025	7349653	0.9754	7168850	12213	87551	306	87858	1958662	1273941	3917324	4.49	6.90	2.24
2030	8272814	0.9754	8069301	14505	117044	410	117454	2492461	1624228	4984922	4.71	7.23	2.36
2035	8698040	0.9754	8484067	17227	146157	512	146669	3202194	2088783	6404388	4.58	7.02	2.29
2040	8861481	0.9754	8643488	20461	176851	619	177470	4134734	2699149	8269468	4.29	6.58	2.15
2045	8910395	0.9754	8691198	24301	211203	739	211942	5333610	3483512	10667221	3.97	6.08	1.99
2050	8976060	0.9754	8755248	28862	252691	884	253576	6853466	4478946	13706931	3.70	5.66	1.85
2055	9085147	0.9754	8861651	34279	303765	1063	304829	8780367	5741353	17560734	3.47	5.31	1.74
2060	9311343	0.9754	9082283	40712	369760	1294	371055	11243799	7354594	22487598	3.30	5.05	1.65
2065	9534752	0.9754	9300196	48353	449696	1574	451270	14412856	9429374	28825712	3.13	4.79	1.57
2070	9749762	0.9754	9509916	57429	546142	1911	548053	18500992	12107564	37001984	2.96	4.53	1.48
2075	9961188	0.9754	9716142	68207	662711	2319	665031	23740502	15539557	47481004	2.80	4.28	1.40
2080	10197187	0.9754	9946335	81009	805741	2820	808561	30423686	19919116	60847372	2.66	4.06	1.33
2085	10459418	0.9754	10202115	96213	981577	3436	985013	38959516	25514532	77919032	2.53	3.86	1.26
2090	10727849	0.9754	10463943	114271	1195725	4185	1199910	49907220	32689628	99814440	2.40	3.67	1.20
2095	10986678	0.9754	10716404	135718	1454410	5090	1459500	63982864	41914388	127965728	2.28	3.48	1.14

2100	**11237233**	**0.9754**	**10960796**	**161190**	**1766776**	**6184**	**1772960**	**82064944**	**53764324**	**164129888**	**2.16**	**3.30**	**1.08**

AUXILIARY TABLE 5 (prices: -0.25%)

								EARNINGS BASIS			TOTAL COST AS PERCENTAGE OF		
			NUMBER			TOTAL					CPP/QPP	GROSS	
YEAR	POPULATION 65 AND OVER	ELIGIBILITY RATE	OF BENE-FICIARIES	AVERAGE BENEFIT	TOTAL BENEFITS	ADMIN. EXPENSES	EXPEN-DITURES	EMPLOYMENT	CPP/QPP CONTRIBUTORY	GDP	EMPLOYMENT EARNINGS	CONTRIB. EARNINGS	DOMESTIC PRODUCT
	#		#	$	$ million	$ million	$ million	$ million	$ million	$ million	%	%	%
1994	3457549	0.9754	3372492	4575	15428	54	15482	379144	256542	758288	4.08	6.03	2.04
1995	3538224	0.9754	3451182	4605	15893	56	15949	402301	270259	804602	3.96	5.90	1.98
1996	3618380	0.9754	3529366	4667	16470	58	16528	430651	285417	861301	3.84	5.79	1.92
1997	3694445	0.9754	3603560	4752	17125	60	17185	451589	298303	903178	3.81	5.76	1.90
1998	3764236	0.9754	3671635	4863	17856	62	17918	475752	313410	951505	3.77	5.72	1.88
1999	3823068	0.9754	3729020	5001	18649	65	18714	503575	330969	1007151	3.72	5.65	1.86
2000	3882516	0.9754	3787004	5159	19539	68	19607	535442	350266	1070884	3.66	5.60	1.83
2005	4182897	0.9754	4079996	6054	24701	86	24787	701705	458734	1403410	3.53	5.40	1.77
2010	4648131	0.9754	4533785	7104	32208	113	32321	909506	592008	1819011	3.55	5.46	1.78
2015	5432367	0.9754	5298729	8336	44170	155	44324	1161501	756239	2323002	3.82	5.86	1.91
2020	6317332	0.9754	6161925	9781	60272	211	60483	1467461	955278	2934922	4.12	6.33	2.06
2025	7349653	0.9754	7168850	11478	82281	288	82569	1840680	1199167	3681360	4.49	6.89	2.24
2030	8272814	0.9754	8069301	13468	108677	380	109058	2314507	1511282	4629014	4.71	7.22	2.36
2035	8698040	0.9754	8484067	15803	134078	469	134547	2938252	1920187	5876505	4.58	7.01	2.29
2040	8861481	0.9754	8643488	18544	160285	561	160846	3748868	2451023	7497736	4.29	6.56	2.15
2045	8910395	0.9754	8691198	21760	189118	662	189780	4778431	3126705	9556862	3.97	6.07	1.99
2050	8976060	0.9754	8755248	25533	223549	782	224331	6067162	3971091	12134323	3.70	5.65	1.85
2055	9085147	0.9754	8861651	29961	265503	929	266432	7680675	5030136	15361350	3.47	5.30	1.73
2060	9311343	0.9754	9082283	35156	319300	1118	320418	9718757	6366292	19437514	3.30	5.03	1.65
2065	9534752	0.9754	9300196	41253	383660	1343	385003	12310031	8066772	24620062	3.13	4.77	1.56
2070	9749762	0.9754	9509916	48407	460343	1611	461954	15614040	10234646	31228080	2.96	4.51	1.48
2075	9961188	0.9754	9716142	56801	551886	1932	553817	19798016	12980214	39596032	2.80	4.27	1.40
2080	10197187	0.9754	9946335	66651	662931	2320	665252	25070034	16441501	50140068	2.65	4.05	1.33
2085	10459418	0.9754	10202115	78209	797895	2793	800688	31722552	20809864	63445104	2.52	3.85	1.26
2090	10727849	0.9754	10463943	91771	960288	3361	963649	40154024	26346024	80308048	2.40	3.66	1.20
2095	10986678	0.9754	10716404	107685	1153999	4039	1158038	50867576	33378516	101735152	2.28	3.47	1.14
2100	11237233	0.9754	10960796	126359	1384997	4847	1389844	64468336	42309872	128936672	2.16	3.28	1.08

HISTORICAL OAS RESULTS

YEAR	POPULATION 65 AND OVER	ELIGIBILITY RATE	NUMBER OF BENE-FICIARIES	AVERAGE BENEFIT	TOTAL BENEFITS	TOTAL ADMIN. EXPENSES	TOTAL EXPEN-DITURES	EARNINGS BASIS EMPLOYMENT	EARNINGS BASIS CPP/QPP CONTRIBUTORY	EARNINGS BASIS GDP	TOTAL COST AS PERCENTAGE OF EMPLOYMENT EARNINGS	TOTAL COST AS PERCENTAGE OF CPP/QPP CONTRIB. EARNINGS	TOTAL COST AS PERCENTAGE OF GROSS DOMESTIC PRODUCT
	#		#	$	$ million	$ million	$ million	$ million	$ million	$ million	%	%	%
1952	1120000	0.6030	675349	471	318	2	320	N/A	N/A	25170	N/A	N/A	1.27
1953	1151200	0.6157	708831	473	335	2	337	N/A	N/A	26395	N/A	N/A	1.28
1954	1184900	0.6231	738315	474	350	2	352	N/A	N/A	26531	N/A	N/A	1.33
1955	1214700	0.6300	765220	474	363	2	365	N/A	N/A	29250	N/A	N/A	1.25
1956	1243900	0.6359	791053	475	376	2	378	N/A	N/A	32902	N/A	N/A	1.15
1957	1270200	0.6456	820042	529	434	2	436	N/A	N/A	34467	N/A	N/A	1.26
1958	1295000	0.6545	847603	655	555	2	557	N/A	N/A	35689	N/A	N/A	1.56
1959	1328800	0.6554	870879	656	571	2	573	N/A	N/A	37877	N/A	N/A	1.51
1960	1357800	0.6612	897782	655	588	2	590	N/A	N/A	39448	N/A	N/A	1.50
1961	1391200	0.6627	921919	654	603	2	605	N/A	N/A	40886	N/A	N/A	1.48
1962	1419000	0.6659	944972	763	721	2	723	N/A	N/A	44408	N/A	N/A	1.63
1963	1448000	0.6675	966542	802	775	2	777	N/A	N/A	47678	N/A	N/A	1.63
1964	1477100	0.6690	988137	892	881	2	883	N/A	N/A	52191	N/A	N/A	1.69
1965	1506700	0.7153	1077728	851	917	3	920	N/A	N/A	57523	N/A	N/A	1.60
1966	1572120	0.7624	1198615	840	1007	4	1011	31757	19954	64388	3.18	5.07	1.57
1967	1608313	0.8282	1332048	840	1119	4	1123	34667	23539	69064	3.24	4.77	1.63
1968	1644812	0.8938	1470199	857	1260	4	1264	40666	25619	75418	3.11	4.93	1.68
1969	1687537	0.9654	1629195	874	1424	6	1430	44652	28002	83026	3.20	5.11	1.72
1970	1310833	1.2883	1688768	954	1611	7	1618	48416	29362	89116	3.34	5.51	1.82
1971	1765198	0.9828	1734774	962	1668	8	1676	51833	30621	97290	3.23	5.47	1.72
1972	1810599	0.9832	1780203	989	1761	6	1767	58598	33078	108629	3.02	5.34	1.63
1973	1858199	0.9824	1825411	1167	2130	5	2135	67159	36112	127372	3.18	5.91	1.68
1974	1907898	0.9821	1873835	1344	2519	7	2526	79341	44650	152111	3.18	5.66	1.66
1975	1960601	0.9819	1925203	1498	2883	8	2891	91981	52894	171540	3.14	5.47	1.69
1976	2025600	0.9749	1974812	1645	3249	14	3263	105094	61238	197924	3.10	5.33	1.65
1977	2092402	0.9726	2035156	1751	3563	17	3580	114065	67741	217879	3.14	5.28	1.64
1978	2158600	0.9721	2098382	1911	4009	19	4028	126153	75718	241604	3.19	5.32	1.67
1979	2233600	0.9757	2179230	2082	4537	18	4555	140304	85701	276096	3.25	5.32	1.65
1980	2308098	0.9786	2258791	2279	5147	22	5169	154595	97809	309891	3.34	5.28	1.67
1981	2379397	0.9776	2326121	2544	5918	26	5944	180632	110861	355994	3.29	5.36	1.67
1982	2444297	0.9774	2388935	2848	6804	28	6832	192350	131047	374442	3.55	5.21	1.82
1983	2502702	0.9783	2448391	3065	7504	34	7538	199275	127373	405717	3.78	5.92	1.86
1984	2569099	0.9774	2511026	3217	8077	35	8112	215946	148847	445604	3.76	5.45	1.82
1985	2654301	0.9777	2595086	3351	8696	36	8732	235626	149482	477988	3.71	5.84	1.83
1986	2742199	0.9784	2682836	3484	9346	35	9381	253525	173465	504631	3.70	5.41	1.86
1987	2842801	0.9773	2778316	3624	10070	35	10105	275058	187658	550334	3.67	5.38	1.84
1988	2929799	0.9770	2862310	3764	10774	33	10807	299275	200036	601508	3.61	5.40	1.80
1989	3024500	0.9748	2948420	3927	11579	37	11616	325564	209544	649916	3.57	5.54	1.79
1990	3116999	0.9741	3036325	4112	12484	44	12528	339470	232375	667843	3.69	5.39	1.88
1991	3218528	0.9716	3127100	4331	13545	47	13592	343228	235802	674766	3.96	5.76	2.01
1992	3299892	0.9728	3209989	4452	14292	50	14342	347816	239245	688391	4.12	5.99	2.08
1993	3381402	0.9727	3289144	4522	14872	52	14924	360932	241489	711658	4.13	6.18	2.10

IV- Actuarial Opinion

In my opinion, for the purposes of this actuarial report,

(a) the data on which the valuation is based are sufficient and reliable for the purpose of the valuation;

(b) the assumptions used are adequate and appropriate; and

(c) the valuation methodology employed is consistent with sound actuarial principles.

This report has been prepared and this opinion given in accordance with generally accepted actuarial principles and the Recommendations of the Canadian Institute of Actuaries.

Bernard Dussault, B.Sc, F.S.A., F.C.I.A.
Chief Actuary

Ottawa, Canada
29 June 1995

APPENDIX A

MAIN PROVISIONS OF THE OLD AGE SECURITY PROGRAM

1. Introduction

The *Old Age Security Act* came into force in December 1951.

Benefits provided pursuant to the Old Age Security Act include the Old Age Security Pension (OAS) which started being paid in 1952, the Guaranteed Income Supplement (GIS) which started in 1967 and the Spouse's Allowance (SPA) which started in 1975. This report covers only the OAS program.

2. Financing

The OAS program is currently financed from federal general tax revenues.

3. Benefits

The OAS pension is a monthly benefit payable to eligible individuals from age 65 until death. To be eligible, previous employment history is not a factor, nor is it necessary to be retired.

(a) Eligibility

Eligibility for an OAS pension is determined at the time of review of an individual's application following attainment of age 65. To be eligible at time of review, an individual must,

- if then a Canadian citizen or a legal resident of Canada,
  have a minimum of 10 years of residence in Canada after reaching age 18, or

- if then neither a Canadian citizen nor a legal resident of Canada,
  have resided at least 20 years in Canada, as a Canadian citizen or a legal resident of Canada, after reaching age 18.

Periods of residence after reaching age 18 in a country with which Canada has concluded a social security agreement may be used to meet the above residence requirements. However, the amount of the OAS pension, described below, is based only on years of residence in Canada.

(b) Amount of Benefits

The amount of the monthly pension payable during a given quarter of a calendar year to a given eligible individual is equal to the OAS monthly benefit rate then applicable times that individual's benefit proportion.

- **Benefit rate**

  The OAS monthly benefit rates applicable during each of the four quarters of 1993 were $378.95, $381.60, $383.51 and $384.66, respectively. The OAS monthly benefit rate is adjusted, but not allowed to decrease, at the beginning of each quarter of each calendar year in line with changes in the Consumer Price Index (CPI). The adjustment applying to the monthly benefit rate of a given years' quarter, producing the monthly benefit rate of the subsequent quarter, is equal to the ratio of:

  . the average CPI over the 3-month period ending with the first month of the given quarter, to

  . the average CPI over the preceding 3-month period.

- **Benefit proportion**

  The benefit proportion is determined once and for all in respect of a given eligible individual when that individual reaches age 65 and is a function of the length of the individual's residence in Canada from age 18 until age 65.

  The benefit proportion is equal to one in respect of an eligible person who

  < has resided in Canada, from age 18 to 65, for periods that total at least 40 years, or

  < has not resided in Canada for at least 40 years, from age 18 to age 65, provided that on 1 July 1977 that person was 25 years of age or over, and

    - was resident in Canada on that date, or
    - had resided in Canada prior to that date and after reaching age 18, or
    - possessed a valid immigration visa on that date.

    In such cases, the individual must have resided in Canada for at least 10 years immediately prior to approval of the application. Any absences in the 10-year period may be offset if the applicant had been present in Canada prior to those 10 years, after reaching age 18, for a total period equal to at least three times the length of the absences. In that case, however, the applicant must also have resided in Canada for at least one year immediately prior to the date on which the application for a pension is approved.

  An eligible person, who does not meet the requirements for a benefit proportion equal to one, qualifies for a partial pension. A partial pension is earned at the rate of 1/40 of the OAS monthly benefit rate for each complete year of residence in Canada between age 1 and age 65. Once a partial pension is approved, it may not be increased as the result of additional years of residence in Canada.

APPENDIX B

DATA, ASSUMPTIONS AND METHODOLOGY

TABLE OF CONTENTS

APPENDIX B

DATA, ASSUMPTIONS AND METHODOLOGY

The purpose of Appendix B is to describe the data, the assumptions and the methodology used in making the financial projections, on the Old Age Security program (OAS), that appear in the main body of this report.

I- POPULATION

1. Data

The following data were used in performing the demographic projections:

(a) Canadian quinquennial censuses

Catalogue No. 93-101 published by Statistics Canada is the main reference used regarding the data on Canadian censuses. The calculation of future employment earnings requires population figures not only for the projection period (1994 to 2100), but also for years from 1966 to 1993. Data from each of the six quinquennial censuses of 1966 to 1991 are accordingly maintained not only for the projection of average earnings and benefits of all relevant cohorts of beneficiaries, but also for methodology validation purposes as described in section II-1(e) below. The 1991 Census data, by age and sex, for Canada, serve as the starting point for the projection of the population until 2100. The census data used for projection purposes consist primarily of the numbers of live persons by age and sex, the proportions of male to female births and the adjustments for undercount.

(b) Postcensal data

In between each Canada quinquennial census, Statistics Canada publishes annually various postcensal data. Data on actual past fertility rates and migration levels, taken from catalogues No. 82-003s14, 82-204 and 91-210, are used as a basis for determining the assumptions required for projecting the actual 1991 population by age and sex. Moreover, previously assumed fertility rates and migration values for the periods 1987 to 1992 and 1993, respectively, were replaced by actual values in the projection process that, in a technical sense, starts in 1966.

(c) Life Tables, Canada and the Provinces, 1985-1987

These mortality tables, published quinquennially by Statistics Canada (catalogue No. 82-003S), are used as a basis for the determination of the assumptions, regarding mortality rates, required for projecting the population into the future. The Life Tables for 1990-1992 were not yet available when this report was completed. The 1985-1987 Canada Life Tables for Canada and the ultimate mortality tables consist of one-year probabilities of death for individual ages from 0 to 106.

(d) The November 1988, 1989, 1990 and 1991 Reports of the Subcommittee on Modelling, Ca Institute of Actuaries' (CIA) Task Force on AIDS.
These studies are the main reference used to estimate the effect of AIDS on mortality rates.

(e) Actuarial Study No. 102
This study, conducted by the Social Security Administration in the U.S.A, shows the extent to which mortality rates could be expected to decrease annually from now until year 2100. These annual rates of decrease were determined by analysing the current trends in mortality decrease separately for each of 10 broad causes of death.

2. Demographic Assumptions

The main table of financial projections, shown in the main body of this report, is based on a single set of realistic demographic assumptions. The demographic assumptions described below relate to this main table, but not to the Auxiliary Tables.

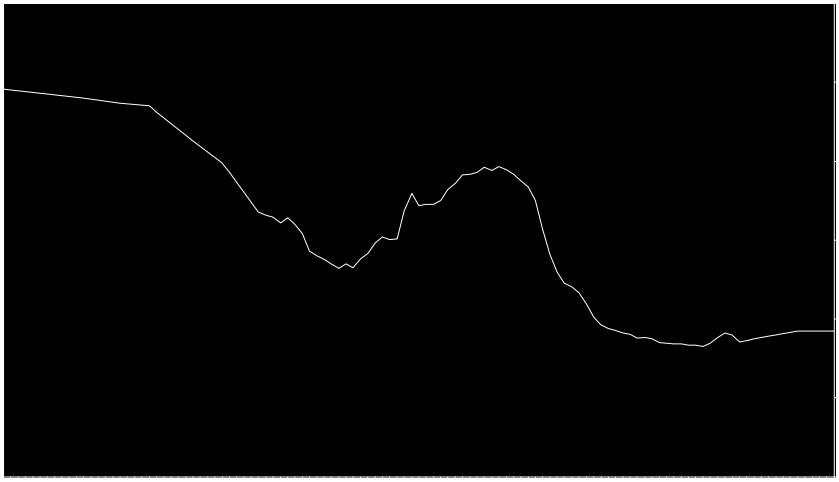
(a) Fertility
The fertility rate for a given age corresponds to the number of live births per female at the given age. The total fertility rate corresponds to the sum of all live births per female over the entire period of reproductive ages. For convenience, such rates are multiplied by 1,000 in the table below.

The actual total fertility rate of 1.710 for 1992 is 6.6% lower than that assumed for 1992 in the preceding actuarial report. The ultimate total fertility rate of 1.85 used in the previous actuarial report has been maintained. For 1993 to 1999, the assumed rate was calculated by linear interpolation between the actual 1992 value of 1.710 and the assumed value of 1.85 for year 2000. The distribution of the assumed ultimate total fertility rate of 1.85 into age-specific rates was made using the corresponding proportions of the 1991 experience.

In accordance with past experience, the assumed ratio of male to female births was taken as 1.056.

FERTILITY RATES
CANADA

Age	calendar year					Group
1970	1975	1980	1985	1990	2000+	
15-19	42.8	35.3	27.6	23.7	26.6	28.1
20-24	143.3	112.7	100.1	85.3	85.5	85.0
25-29	147.2	131.2	129.4	125.3	132.2	132.1
30-34	81.8	64.4	69.3	74.6	88.1	
90.5						
35-39	39.0	21.6	19.4	21.8	28.8	30.0
40-44	11.3	4.8	3.1	3.0	3.9	4.1
45-49	0.9	0.4	0.2	0.1	0.1	0.2
Total	2,331.5	1,852.0	1,745.5	1,669.0	1,826.0	1,850.0



(b) Mortality (Canada Life Tables, mortality reductions, AIDS)

Canada Life Tables for 1990-1992 were not yet available when this report was completed. However, an analysis of preliminary results of these tables indicates that they correspond very closely in aggregate, i.e., 99% and 100% in terms of life expectancies at birth, for males and females, respectively, to the mortality rates projected for 1991 under the previous report from the 1985-1987 tables. Therefore, mortality rates shown in Life Tables, Canada and the Provinces, 1985-1987 (see section 1(c) above), assumed to be applicable for 1986, were used as the starting point for mortality assumptions. However, these rates were adjusted (decreased) to account for the population undercount which was disregarded in the construction of the 1985-1987 Canada Life Tables.

To reflect anticipated sustained improvements in life expectancy, the 1986 mortality rates were projected to the year 2100 using the following annual rates of decrease:

i) For 1987 to 2010, the annual rates of decrease, varying by age, sex and calendar year, were determined by linear interpolation between:
   - the average reduction rates experienced in Canada between 1976 and 1986, and
   - the constant reduction rates, described in ii) below, in respect of the period running from 2011 to 2100.

ii) For 2011 and later years, the annual rates of decrease, varying by age and sex only, not by calendar year, are those identified as *Alternative II (medium)* in Actuarial Study No. 102 (see section 1(e) above).

To account for AIDS, male mortality was increased for the years 1989 to 2018 by the increments estimated by the Canadian Institute of Actuaries (see section 1(d) above). A constant level of new infections is assumed to hold from 1984 to 1988 and to decrease gradually from that level to 0 in 1999. Subsequent studies of the CIA's Task Force on AIDS for 1989 to 1991 have also been examined. These studies show average extra mortality lower than that of the 1988 study; however, recent trends indicate that AIDS-related extra mortality might return, after 1991, to levels previously assumed. For these reasons, the assumptions of the previous actuarial report were maintained for this report. On the basis of the cumulative number of deaths attributable to AIDS (as reported by the Federal Centre for AIDS), female mortality was also increased, but by only 10% of the above increments for males.

Life Expectancies (longevity expressed in number of years) resulting from the above mortality assumptions are shown below for Canada as a whole. The following results are higher than those of the fifteenth CPP report because they account for the undercount adjustment.

Year	At birth		At age 65		
	males	females	males	females	calculation basis
1986	73.3	80.0	15.0	19.3	without improvements in life expectancy
1986	78.1	85.1	15.8	20.7	with improvements in life expectancy
2100	82.6	89.7	19.9	25.7	with improvements until 2150

The first table below shows sample values of the ultimate mortality rates as well as sample values of mortality rates of the 1985-87 Canada Life Tables, all before AIDS adjustments. The second table shows sample values of the extra mortality assumed to apply in connection with AIDS.

MORTALITY RATES
(before AIDS adjustments)
(number of annual deaths per 1,000 persons)

	MALES	
Age	1985-87 Canada Life Tables	Rates Assumed for Year 2100
0	8.58	2.24
1	0.67	0.27
5	0.30	0.12
10	0.18	0.08
20	1.30	0.64
30	1.30	0.83
40	1.97	0.95
50	5.32	2.50
60	14.68	7.75
70	36.73	21.21
80	86.65	52.59
90	191.97	114.49
95	276.51	162.25
100	359.43	203.23
105	796.02	512.26

	FEMALES	
Age	1985-87 Canada Life Tables	Rates Assumed for Year 2100
0	6.78	1.61
1	0.62	0.24
5	0.22	0.07
10	0.14	0.05
20	0.42	0.20
30	0.51	0.26
40	1.12	0.53
50	3.12	1.68
60	7.51	4.23
70	18.67	10.23
80	51.73	27.19
90	144.15	72.61
95	230.03	117.16
100	322.72	163.52
105	785.62	454.91

EXTRA MORTALITY RATES IN RESPECT OF AIDS (*)
(number of annual deaths per 1,000 persons)

	CALENDAR YEAR				
Age	1995	2000	2005	2010	2015
25	0.33	0.38	-	-	-
30	0.80	0.90	0.62	-	-
35	0.60	0.86	0.59	0.29	-
40	0.46	0.50	0.44	0.21	0.07
45	0.34	0.35	0.23	0.14	0.05
50	0.23	0.25	0.16	0.08	0.03
55	0.19	0.17	0.12	0.05	0.02
60	0.16	0.15	0.08	0.04	0.01
61+	-	-	-	-	-

(*) 100% of these increases apply to male mortality rates; only 10% apply to female rates.

(c) Migration

Immigration and emigration are generally recognized to be volatile parameters of future population growth, since they are subject to a variety of demographic, economic, social and political factors; immigration, especially, is subject to government control. During the period from 1 June 1966 to 31 May 1993, for example, annual immigration to Canada varied fro 82,939 to 257,465, and annual emigration out of Canada is estimated to have fluctuated between 37,314 and 111,500.

For purposes of this report it was assumed, for 1992, that there would be 163,000 immigrants entering Canada and 50,000 emigrants leaving Canada. These figures correspond approximately to the 1983-1993 averages and were increased with time so as to maintain a constant ratio of net immigration to total current Canadian population of 0.4%.

The distribution of immigrants and emigrants by age group and sex used for the demographic projections corresponds to Statistics Canada data averaged over mid-1988 to mid-1993.

DISTRIBUTION OF IMMIGRANTS AND EMIGRANTS
(mid-1988 to mid-1993 average)

	Immigrants		Emigrants	
Age group	males (%)	females (%)	males (%)	females (%)
0- 4	3.711	3.517	2.979	2.660
5- 9	4.179	3.848	3.891	3.879
10-14	3.893	3.614	3.650	3.572
15-19	3.954	3.850	3.424	3.185
20-24	5.486	6.028	4.047	5.024
25-29	7.745	7.445	7.340	7.969
30-34	6.620	6.319	7.212	6.774
35-39	4.608	4.358	6.052	5.291
40-44	2.861	2.598	5.015	4.042
45-49	1.628	1.621	2.573	2.172
50-54	1.209	1.553	1.578	1.430
55-59	1.191	1.552	1.071	0.929
60-64	1.205	1.448	0.708	0.617
65-69	0.819	1.016	0.619	0.792
70+	0.882	1.233	0.604	0.894
TOTAL	49.991	50.009	50.763	49.237

3. Methodology

The most recent Canada population census is as at 1 June 1991. The starting point for demographic projections purposes accordingly corresponds to mid-1991 and consists of numbers of males and females by age. However, population data for 1966 to 1990 are also required for the calculation of future benefits of the relevant cohorts of contributors and beneficiaries. For this latter purpose, use is made of historical data, developed by Statistics Canada. These historical data take into account the 1991 change in the definition of the census population which now includes both permanent and non-permanent residents of Canada.

The 1991 census data for Canada are available by individual ages up to 89, but the data for ages 90 and over are grouped. Hence, the latter data were dis-aggregated for individual ages 90 to 106 by surviving the population data at age 89, using the 1985-1987 Life Tables, up to age 106. A constant proportional adjustment was made to the population so survived for each age from 90 to 106 to matcl its total with the census aggregate value for this age group.

To compensate for the census undercount, adjustment factors developed by Statistics Canada were applied to the 1986 census population data. These factors vary by age and sex.

The population, by age and sex, was then projected from one year to the next until 2100 by adding births and immigrants and subtracting deaths and emigrants. The annual numbers of births, deaths, immigrants and emigrants were developed by applying the fertility, mortality and migration assumptions to the mid-year population.

4. Population Tables

The first two tables below show the projected Canada mid-year populations for 1991, 1995, 2000, 2025, 2050, 2075 and 2100. The populations shown are distributed by sex and broad age groups. The third table shows corresponding dependency ratios.

POPULATION (in thousands)
CANADA
BOTH SEXES

	Age Group	1991	1995	2000	2025	2050	2075	2100
	0- 4	1977	2050	2010	2126	2254	2403	2578
	5- 9	1956	1996	2095	2152	2275	2433	2614
	10-14	1926	1990	2041	2150	2295	2466	2653
	15-19	1942	1957	2032	2147	2325	2503	2687
TOTAL	0-19	7801	7993	8178	8575	9149	9805	10532
	20-24	2136	2023	2013	2210	2391	2563	2745
	25-29	2517	2221	2099	2325	2488	2646	2829
	30-34	2640	2650	2290	2447	2556	2712	2909
	35-39	2351	2620	2694	2399	2563	2742	2954
	40-44	2148	2313	2637	2365	2536	2747	2963
	45-49	1667	2066	2308	2275	2525	2736	2941
	50-54	1347	1587	2048	2252	2523	2710	2895
	55-59	1244	1289	1561	2320	2513	2642	2819
	60-64	1197	1208	1254	2572	2345	2523	2717
TOTAL	20-64	17247	17977	18904	21165	22440	24021	25772
	65-69	1090	1110	1132	2356	2162	2345	2567
	70-74	834	960	992	1872	1893	2139	2360
	75-79	624	666	804	1425	1622	1875	2073
	80-84	382	455	505	859	1341	1528	1686
	85-89	192	232	296	476	1066	1060	1227
	90+	95	116	153	362	891	1013	1324
TOTAL	65+	3217	3539	3882	7350	8975	9960	11237
GRAND TOTAL		28265	29509	30964	37090	40564	43786	47541

POPULATION (in thousands)
CANADA
BY SEX

Age Group	1991	1995	2000	2025	2050	2075	2100
				Males			
0- 4	1004	1049	1031	1092	1159	1235	1325
5- 9	1001	1015	1073	1107	1170	1251	1344
10-14	986	1019	1039	1108	1181	1269	1365
15-19	994	1002	1040	1104	1195	1287	1382
0-19	3985	4085	4183	4411	4705	5042	5416
20-24	1082	1032	1028	1130	1225	1314	1408
25-29	1275	1122	1068	1188	1273	1355	1449
30-34	1335	1339	1154	1247	1308	1388	1489
35-39	1177	1319	1357	1214	1310	1401	1509
40-44	1082	1156	1324	1200	1293	1400	1511
45-49	841	1039	1150	1151	1282	1392	1498
50-54	677	797	1024	1132	1277	1374	1470
55-59	621	641	776	1148	1261	1332	1422
60-64	584	593	614	1259	1156	1258	1356
20-64	8674	9038	9495	10669	11385	12214	13112
65-69	500	524	542	1128	1050	1147	1259
70-74	364	420	449	858	887	1011	1124
75-79	256	271	328	619	716	843	943
80-84	142	168	185	340	537	633	713
85-89	62	74	94	163	375	387	465
90+	25	30	38	94	242	287	389
65+	1349	1487	1636	3202	3807	4308	4893
Total males	14008	14610	15314	18282	19897	21564	23421
				Females			
0- 4	973	1001	979	1034	1095	1168	1253
5- 9	955	981	1022	1045	1105	1182	1270
10-14	940	971	1002	1042	1114	1197	1288
15-19	948	955	992	1043	1130	1216	1305
0-19	3816	3908	3995	4164	4444	4763	5116
20-24	1054	991	985	1080	1166	1249	1337
25-29	1242	1099	1031	1137	1215	1291	1380
30-34	1305	1311	1136	1200	1248	1324	1420
35-39	1174	1301	1337	1185	1253	1341	1445
40-44	1066	1157	1313	1165	1243	1347	1452
45-49	826	1027	1158	1124	1243	1344	1443
50-54	670	790	1024	1120	1246	1336	1425
55-59	623	648	785	1172	1252	1310	1397
60-64	613	615	640	1313	1189	1265	1361
20-64	8573	8939	9409	10496	11055	11807	12660
65-69	590	586	590	1228	1112	1198	1308
70-74	470	540	543	1014	1006	1128	1236
75-79	368	395	476	806	906	1032	1130
80-84	240	287	320	519	804	895	973
85-89	130	158	202	313	691	673	762
90+	70	86	115	268	649	726	935

65+	**1868**	**2052**	**2246**	**4148**	**5168**	**5652**	**6344**
Total females	**14257**	**14899**	**15650**	**18808**	**20667**	**22222**	**24120**

DEPENDENCY RATIOS (%)
Canada

Year	Both Sexes		
	Children[1]	Seniors[2]	Total[3]
1991	45.2	18.7	63.9
1995	44.5	19.7	64.1
2000	43.3	20.5	63.8
2025	40.5	34.7	75.2
2050	40.8	40.0	80.8
2075	40.8	41.5	82.3
2100	40.9	43.6	84.5

Year	Males		
	Children[1]	Seniors[2]	Total[3]
1991	45.9	15.6	61.5
1995	45.2	16.5	61.7
2000	44.1	17.2	61.3
2025	41.3	30.0	71.4
2050	41.3	33.4	74.8
2075	41.3	35.3	76.6
2100	41.3	37.3	

78.6

Year	Females		
	Children[1]	Seniors[2]	Total[3]
1991	44.5	21.8	66.3
1995	43.7	22.9	66.7
2000	42.5	23.9	66.3
2025	39.7	39.5	79.2
2050	40.2	46.7	86.9
2075	40.3	47.9	88.2
2100	40.4	50.1	90.5

1 Population aged 19 years and under as a percentage of population aged 20 to 64 years.
2 Population aged 65 years and over as a percentage of population aged 20 to 64 years.

3 Population aged 19 years and under, plus population aged 65 years and over, as a percentage of population aged 20 to 64 years.

II- EMPLOYMENT EARNINGS AND BENEFITS

1. Data

(a) Demographic

Historical (1966-1991) and projected (1992-2100) populations, the output of section I above, are used for various computational purposes in the economic projections. For example,

- ratios of the actual number of earners to the population correspond to the proportions of earners;
- the product of the relevant population, the benefit eligibility rate, and the average annual rate of OAS benefit produces the amount of projected benefits;

(b) Economic indices

The Consumer Price Index (CPI) and the Average Industrial Aggregate Wages statistic (AIAW, the current measure of the average rate of weekly wages and salaries) are produced by Statistics Canada (catalogues 11-010 and 72-002, respectively). The observed (1966 to 1994) annual increases in the CPI and the AIAW replace, for methodology validation purposes, values assumed in the previous actuarial reports; they are also used as a basis for the determination of corresponding assumptions for the future. For purposes of selecting related assumptions, use was also made of the CPI and AIAW indices averaged over the last 5, 10, 15, 25 and 50 years as determined by the Canadian Institute of Actuaries in its 1994 report on Canadian Economic Statistics. Rates of interest are not required for purposes of this report.

(c) Earnings statistics

Statistics on the average employment earnings, by sex and quinquennial age-group, of all workers covered by the CPP (i.e., Canada less Québec basis) are prepared annually and transmitted electronically by officials of Human Resources Development Canada (HRD) involved in the administration of the CPP. These data originate from Revenue Canada, which is responsible for the processing of CPP contributions through salary deductions. The employment earnings data pertaining to a given calendar year normally become available in the second year (about mid-year) following that given year. This delay is due partly to the contribution adjustments resulting from tax returns filed after the given year but mainly by the annual (as opposed to monthly) cycle of Revenue Canada's allocation of monthly pay deductions between Unemployment Insurance and CPP contributions. In summary, these earnings statistics include the number of earners and the average annual employment earnings of these earners.

(d) Aggregate Employment Earnings for Canada

The amount of total employment earnings for all of Canada is made available each year by the Chief Actuary for the Canada Employment and Immigration Commission. This amount actually originates from Revenue Canada and is exclusive of employment earnings earned by self employed workers.

(e) Administrative reports

The annual accounting reports and the Reference Guide on Income Security Programs, flowing from the administration of the OAS by HRD, provide aggregate financial data on the OAS such as the number of beneficiaries, the amount of benefits and the administrative expenses.

Such aggregate data are also compiled over each calendar year after the preparation of an actuarial report and compared with corresponding aggregate projected values of that report for methodology validation purposes until the next report comes due.

2. Economic Assumptions

The main table of financial projections shown in the main body of this report is based on a single set of realistic economic and demographic assumptions. The economic assumptions described below relate to this main table, but not to the auxiliary tables.

(a) Key assumptions

The key economic assumptions involved in the projection of employment earnings and benefits are the annual rates of increase in average employment earnings and in the CPI. Rates of interest are not required for projections covered in this report.

For the period 1995 to 1999, the assumptions were derived to fall smoothly between the 1994 experience and the ultimate (2000 and subsequent years) assumptions described below.

Since the financial projections of this report cover a long period, long-term key economic assumptions were chosen on the basis of:

- The average long-term (about 50 years) past experience and the observed trends over the past short (about 15 years) and medium (about 25 years) terms.
- Judgmental opinion as to the outlook of the overall economy over the future long term.

It was accordingly decided to maintain the ultimate assumptions for the annual increase in prices and average employment earnings at 3.5% and 4.5%, respectively, as for the previous actuarial report. This decision rests among other things on the fact that:

- The actual gap between the annual rates of increase in average employment earnings and prices, each measured using ratios of the relevant yearly average index over that of the previous year, has been equal on average in 1993 over the last 5, 10, 15 and 25 years, to 0.01%, –0.18%, 0.01% and 0.86%, respectively. The average gap over the last 50 years, measured as the ratio of the year-end relevant index to that of the previous year, is 1.52%. The assumed gap of 1% therefore corresponds closely to the actual recent 25-year average.

- It is generally believed that, in this post-industrialized era where the economy is more and more service-oriented, the productivity rate should not, in the long-term, be as high as during the industrialized era.

The table below shows the short-term and ultimate assumptions adopted for this report regarding the annual increases in earnings and prices.

ANNUAL RATE OF INCREASE IN PRICES AND AVERAGE EMPLOYMENT EARNINGS

YEAR	PRICES (%)	EARNINGS (%)	earnings-prices GAP (**) (%)
1985 (*)	3.9	3.5	(0.4)
1986 (*)	4.2	3.0	(1.2)
1987 (*)	4.4	3.8	(0.6)
1988 (*)	4.0	4.4	0.4
1989 (*)	5.0	5.2	0.2
1990 (*)	4.8	4.5	(0.3)
1991 (*)	5.6	4.6	(1.0)
1992 (*)	1.5	3.4	1.9
1993 (*)	1.8	1.7	(0.1)
1994 (*)	0.0	1.9	1.9
1995	1.0	2.0	1.0
1996	1.5	2.5	1.0
1997	2.0	3.0	1.0
1998	2.5	3.5	1.0
1999	3.0	4.0	1.0
2000 (ultimate)	3.5	4.5	1.0

(*) Rates for these years are actual experience rates.
(**) Brackets mean that these rates are negative.

(b) Secondary (other than key) economic assumptions

i) Proportions of earners

The assumed proportions of earners were determined, on a Canada less Québec basis, exactly as under the CPP fifteenth statutory actuarial report as at 31 December 1993.

In respect of each past year (1966 to 1992), actual proportions of earners are computed, by age and sex, as the ratio of the number of earners (from earnings statistics) to the corresponding population (from demographic computations). In addition to being used for the computation of the past and future benefits of the relevant cohorts of contributors, these historical values constitute an important reference for the selection of assumed future proportions of earners.

These proportions for the future were accordingly determined taking partly into account the trends in their counterpart actual, adjusted (see 3.c below) values for 1966 to 1992. These trends reveal quite variable proportions for males, and significant year to year increases for females.

Male proportions of earners are assumed to reach by year 2000 the levels at which they were on average from 1975 to 1980, before the 1982-1984 and the early 1990s recessions. These assumed ultimate proportions rest upon a deemed average rate of unemployment comparable to that prevailing during that period, i.e., about 7.5%. Assumed proportions for 1993 to 1999 were obtained by interpolation between the latest experience figures (i.e., 1992) and the values assumed for 2000 and subsequent years.

Since 1985, proportions of females with earnings have increased much more rapidly than anticipated, and in 1990 had already, on average, reached the levels assumed in previous actuarial reports for 2050. It was accordingly decided to maintain the assumptions of the previous report from the ultimate year (varying by age for females) to 2100, and to determine values for intermediate years by linear interpolation from the actual 1992 values and those assumed for the applicable ultimate year.

Each set of male and female values for proportions of earners so resulting for 1993 to 2000 corresponds to annual increases of about 2% in the labour force.

Selected values of the adjusted past actual and future assumed proportions of earners is shown by age, sex and calendar year in section 3(b) below.

ii) Average employment earnings

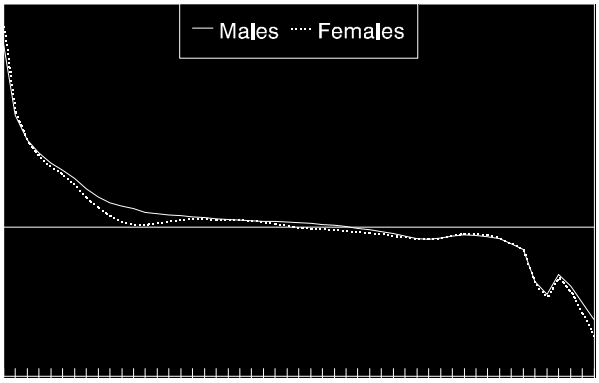
The assumed average employment earnings were determined, on a Canada less Québec basis, exactly as under the CPP fifteenth statutory actuarial report as at 31 December 1993.

In respect of a cohort of earners of a given age and sex, the average employment earnings for a given calendar year correspond to the ratio of the sum of individual employment earnings earned during the year to the number of earners in the cohort. Average employment earnings for each such age-sex cohort are assumed to increase from one year to the next at the same rate as the AIAW. The AIAW, compiled by Statistics Canada, corresponds to the weekly rate of pay, at a particular point in time, averaged over all industries.

For a given age, average employment earnings are deemed to increase from one year to the next (but keeping the age constant) at the assumed rate of increase in the AIAW. Consistent with past experience, the annual seniority and promotional increases are accordingly implicitly assumed constant at the actual 1992 rates for every year of the projection period. The seniority and promotional increase for a given *age/year* cell is accordingly deemed equal to the ratio, minus one, of the average earnings for that *age/year* cell to the average earnings for the *preceding age/same year* cell. Therefore, projected average earnings for a given *age/year* cell are obtained simply by applying the annual increase in the AIAW assumed for this year to the average earnings for the *same age/previous year* cell.

$$EMPEAR_x^N = EMPEAR_{x-1}^{N-1} \times (1+p_x^N) \times (1+s^N) = EMPEAR_x^{N-1} \times (1+s^N)$$

where N = calendar year
x = age attained during calendar year N
EMPEAR = average employment earnings
p_x^N = constant (by year) promotional and seniority rate of change in EMPEAR from age x-1 to age x
= $\{EMPEAR_x^{1992} / EMPEAR_{x-1}^{1992}\} - 1$
s^N = assumed constant (for any given age or sex) overall annual increase in EMPEAR from year N-1 to N



However, this rate of earnings increase assumption is subject to the following two adjustments:

- The preceding statement of the above assumption implies that the effect, on average employment earnings, of unemployment levels prevailing on average during the base year (1992) of earnings projections, will remain constant each year in the future. Whenever the actual level of average unemployment during the base year of earnings projections is not deemed representative of the expected average level of unemployment of 7.5% in the long term, projected average earnings are adjusted over the next 5 to 10 years consistent with this 7.5% unemployment level. The temporary reduction effect of the early 1990s recession on average employment earnings was removed by dividing male and female average employment earnings projected for 199 and subsequent years by 0.945 (determined on the basis of past experience).

- The assumed annual rate of increase in the AIAW was not implemented uniformly by s since it was further assumed that an annual geometrical narrowing of 1% in the gap between male and female average employment earnings would apply. Hence, rates of increase in average employment earnings were developed by age and by sex so as to produce:
  - an aggregate rate of increase equal to that assumed for the AIAW;
  - rates of increase for each age, both sexes combined, that would be the same for all ages; and
  - separate rates of increase for male and female average earnings for each age such that the ratio of female to male average earnings would move 1% of the way to unity each year.

3. Methodology

(a) General Approach

The projections carry forward to year 2100. The actuarial approach used for projections is macro-simulated as opposed to micro-simulated. One of the important characteristics of such macro-simulation is that projections are made relying on grouped, as opposed to individual, data (mainly numbers of persons and earnings). This results in the need for a considerably smaller volume of data to be processed. Using micro-simulation, individual benefits can be easily determined via calculations involving individual data. Using macro-simulation, only aggregate benefits (i.e., combined by age and sex separately for each year of benefit payment) can be obtained directly, since the data used in the computational processes are aggregate values.

(b) Proportions of Earners and Average Employment Earnings

As mentioned in section 1(c) above, earnings statistics are combined into quinquennial age groups. Since the valuation process works on an individual age basis, actual past Proportions of Earners and Average Employment Earnings are desegregated to an individual age basis using appropriate interpolation formulae.

They are also adjusted so that the age corresponds to 1 July instead of 31 December of the relevant calendar year. This is required because the valuation methodology is designed on an average mid-year basis. For this purpose, specific 4-pivotal point actuarial interpolation formulae were developed.

A sample of past actual and future assumed proportions of earners and average employment earnings is shown in the tables below on a Canada less Québec basis.

PROPORTIONS OF EARNERS
(past actual adjusted and future assumed)
Canada Less Québec basis

	Calendar year					
Age	1980	1990	2000	2025	2050	2100
Males						
20	0.8967	0.7878	0.8600	0.8600	0.8600	0.8600
25	0.9445	0.9335	0.9600	0.9600	0.9600	0.9600
30	0.9784	0.9228	0.9900	0.9900	0.9900	0.9900
35	0.9747	0.9431	1.000**(*)**	1.000**(*)**	1.000**(*)**	1.000**(*)**
40	0.9436	0.9598	0.9700	0.9700	0.9700	0.9700
45	0.9331	0.9556	0.9500	0.9500	0.9500	0.9500
50	0.9113	0.9288	0.9000	0.9000	0.9000	0.9000
55	0.8829	0.8682	0.8700	0.8700	0.8700	0.8700
60	0.7673	0.6973	0.7200	0.7200	0.7200	0.7200
65	0.4722	0.3149	0.3600	0.3600	0.3600	0.3600
Females						
20	0.7990	0.7227	0.8036	0.8700	0.8700	0.8700
25	0.7612	0.8679	0.8082	0.8430	0.8500	0.8500
30	0.6938	0.7984	0.7666	0.7833	0.7900	0.7900
35	0.6804	0.8179	0.7729	0.8211	0.8500	0.8500
40	0.6786	0.8429	0.7981	0.8270	0.8500	0.8500
45	0.6470	0.7706	0.7479	0.7939	0.8400	0.8400
50	0.5878	0.7109	0.7441	0.7650	0.7858	0.7900
55	0.4937	0.6278	0.6318	0.6936	0.7553	0.7800
60	0.3559	0.4242	0.4151	0.4362	0.4573	0.4700
65	0.1847	0.1640	0.1501	0.1347	0.1193	0.1100

* Rates higher than one in the above table may be explained as follows:

1. Earners include all persons who ever had earnings during the year, whereas the population count is taken as at mid-year and does not record the number of all persons who ever lived in Canada during the year.
2. The undercount adjustments made to the census populations may be underestimated for certain ages.
3. The possession of more than one Social Insurance number by some individuals and the consequent overcount of earners.
4. The presence of individuals who have employment earnings, but are not included in the population count, such as students with working permits but no landed immigrant status, and persons with business visas.
5. The presence of dual earners, who would be included both as CPP contributors and Québec Pension Plan contributors.
6. The fact that the Armed Forces personnel and the members of the RCMP who are employed in Québec outside Canada, contribute to the Canada Pension Plan. They are therefore included in the

numerator (numbers of earners) of the proportions

AVERAGE EMPLOYMENT EARNINGS
(past actual adjusted and future assumed)
Canada Less Québec basis

		calendar year					
	Age	1980	1990	2000	2025	2050	2100
Males	20	8285	10065	11389	34454	101984	906300
	25	13860	20645	25668	77390	228638	2025805
	30	17604	27879	35848	106693	312450	2735905
	35	20190	32503	42185	125099	364407	3166759
	40	21046	36220	46905	138470	403405	3503574
	45	21025	38110	50149	147619	430181	3722518
	50	20688	37481	50798	148642	431180	3719690
	55	19555	33920	45075	133338	387959	3347098
	60	17450	30364	39748	118046	344652	2996859
	65	10044	17170	23670	69948	203870	1792366
Females	20	5839	8238	9963	31098	94259	864766
	25	9007	15750	21589	67824	206658	1907978
	30	9701	18064	26080	84082	260945	2463051
	35	9782	19725	28392	93283	292318	2787746
	40	9909	21467	31572	103261	323621	3084349
	45	9889	21659	32537	107294	338778	3243992
	50	9836	20531	31619	104989	332684	3205618
	55	9485	18348	27774	93528	297865	2876836
	60	9276	16911	24936	83829	266948	2588078
	65	6045	9979	14753	49451	157403	1545206

(c) Total Employment Earnings

Aggregate employment earnings for Canada less Québec for a given calendar year corresponds to the sum, over each age and sex, of the products of the Canada less Québec population by the appropriate Canada less Québec proportion of earners and by the appropriate Canada less Québec average employment earnings. Aggregate employment earnings for all of Canada were obtained by multiplying the total employment earnings computed as above for Canada less Québec by 1.28, which corresponds to the ratio, averaged over 1992 and 1993 using statistics exclusive of self-employed earners, from the Canada Employment and Immigration Commission (CEIC), of total employment earnings for Canada to total employment earnings for Canada less Québec. Aggregate CPP/QPP contributory earnings resulting, using the methodology described in Appendix B of the CPP fifteenth actuarial report, from these adjusted aggregate employment earnings, correspond to 98% on average for 1983 to 1992 of actual corresponding experience data. Employment earnings were accordingly further increased by 2.075%.Actual total Canada employment earnings, exclusive of self-employed earnings, reported by the Canada Employment and Immigration Commission (CEIC), correspo on average for 1983 to 1992 to 97.93% of the employment earnings finally adjusted as above. This indicates that in aggregate self-employed earnings would correspond to about 2 % of aggregate employment earnings. No experience data could be obtained to validate this conclusion.

(d) OAS Benefits

- **General approach**

  Total OAS benefits projected for a given calendar year are equal to the average number of OAS beneficiaries projected for that year times the average annual rate of OAS benefit projected for that year.

- **Average number of beneficiaries**

  The projected average number of OAS beneficiaries for any given year after 1993 is equal to the product of the OAS assumed eligibility rate and the total Canadian population, at ages 65 and over, projected for that year.

  The eligibility rate for OAS benefits for a given year is defined as the ratio of the average number of OAS beneficiaries for the year to the total Canadian population at ages 65 and over as of July 1 of the year. The actual OAS eligibility rate averaged 97.5% over 1984 to 1993 and fluctuated very little. For purposes of OAS benefit projections, it was therefore assumed that the OAS eligibility rate would be 97.5% in 1994 and remain constant thereafter.

- **Average annual rate of OAS benefit**
  For 1994, the actual average annual rate of OAS benefit was $4,574.52, calculated as total benefits paid during the year divided by total average number of beneficiaries for the year. For any given year after 1993, the average annual rate of OAS benefit was set equal to the previous year's average annual rate of OAS benefit times the following indexation factor:

  $$\textbf{indexation factor} = (1+c_{N-1})^{1/3} + (1+c_N)^{2/3}$$

  where c_N = assumed rate of increase in CPI from year "N-1" to year "N"

- **Income taxes**
  The Old Age Security pension is subject to federal and provincial income taxes. Moreover, for purposes of federal income taxes, the OAS is reimbursable at the rate of 15% of the individual income exceeding a threshold which is increased annually in accordance with the increase in the consumer price index minus 3 percentage points; this threshold was $50,000 for 1989. The government has stated that it would review the threshold periodically and adjust it as appropriate. Since the reimbursement, generally referred to as "claw-back", is required under the Income Tax Act and not under the OAS Act, it has not been taken into account for purposes of financial projections in this report. It is not believed at this time that the effect of the "claw-back" on take-up rates of OAS pensions is likely to be significant.

(e) Administrative Expenses
On the basis of past financial experience of the Program, OAS administrative expenses were assumed to be equal to 0.35% of total OAS benefits projected for each future calendar year.

4. Costs Bases

In addition to the absolute current dollar amounts of expenditures projected for each calendar year, which is the most simple and natural basis for expressing OAS costs, they were also expressed on the following three earnings bases, each of which corresponds to the ratio of these current dollar expenditures to the given earnings bases:

- Employment earnings
- Gross Domestic Product (GDP)
- CPP/QPP contributory earnings

It was recognized that the Gross Domestic Product (GDP) is a very suitable basis since OAS benefits are financed through general revenues and not on the basis of total employment earnings. For this purpose, the GDP was projected, on the basis of the average 1984-1993 experience, as 2.0 times the projected total employment earnings.

On the other hand, the CPP/QPP contributory earnings basis was also deemed convenient as a way providing interested parties with a consistent basis for comparing OAS costs with those of the CPP/QPP. These contributory earnings were computed using the methodology described in Appen of the fifteenth CPP actuarial report as at 31 December 1993.

III- INDEX OF KEYWORDS AND ACRONYMS